Eastbound I-580 HOV to Express Lanes Conversion Project Concept of Operations Plan

Alameda County
Congestion Management
Agency

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And

URS

FINAL DRAFT

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Submitted to

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Congestion Management
Agency

Submitted by
The Partnership team of

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ACCMA	Alameda County Congestion Management Agency
ACTIA	Alameda County Transportation Improvement Authority
BATA	Bay Area Toll Authority
AMS	Account Management System
AVI	Automatic Vehicle Identification
CAD	Customer Account Database
CALTRANS	California Department of Transportation
CHP	California Highway Patrol
CCTV	Closed-Circuit Television
CSR	Customer Service Representative
CMS	Changeable Message Signs
CTOC	California Toll Operators Committee
DMS	Dynamic Message Sign
DSRC	Dedicated Short Range Communication
FHWA	Federal Highway Administration
EL	Express Lanes
ETC	Electronic Toll Collection
ETS	Electronic Toll System
FAQ	Frequency Asked Questions
GUI	Graphical User Interface
HOT	High Occupancy Toll
HCM	Highway Capacity Manual
HOV	High Occupancy Vehicle
HTML	Hypertext Markup Language
IVR	Interactive Voice Response
LOS	Level Of Service
LTD	Largest Traffic Density
MF	Mixed-Flow
MPH	Miles Per Hour
MTBF	Mean Time Between Failure
NSF	Non Sufficient Funds
PDF	Portable Document Format
PIN	Personal Identification Number
RCSC	Regional Customer Service Center
RF	Radio Frequency
ROW	Right of Way
RSE	Roadside Equipment
SOV	Single Occupant Vehicle
SR	State Route
TD	Traffic Density
TMC	Traffic Management Center
TDC	Toll Data Center

TP	Transaction Processor
TPS	Transaction Processor System
TZ	Tolling Zone
TZC	Tolling Zone Controller
VDS	Vehicle Detection System
WAN	Wide Area Network

1. EXECUTIVE SUMMARY

In order to provide better traffic flow on I-580 in Alameda County, an eastbound high occupancy vehicle (HOV) lane will be converted to dual High Occupancy Toll (HOT) lanes referred to as Express Lanes (EL) for this project. The Project Limits are from just west of the Hacienda Drive Interchange to just east of the Greenville Road Interchange. The Alameda County Congestion Management Agency (ACCMA) has been tasked and authorized to convert the existing HOV lane in the eastbound direction to two EL.

EB I-580 was selected for this project because it is expected to experience significant traffic congestion during the morning peak period at the time in which the project will be opened to traffic. Conversion of the EB I-580 HOV lane to dual EL will be accomplished utilizing proven technology, traffic engineering expertise, and the concept of dynamic pricing with the goals of more efficiently using existing roadway capacity to improve traffic flow in the corridor and of generating revenue in future years for other transportation and transit improvements in the corridor.

As of this writing, the eastbound HOV lane allows continuous access for eligible vehicles to and from the mixed-flow (MF) lanes. In addition, the current eastbound HOV lane serves as a mixed-flow lane during off-peak travel periods. Under the new configuration all eligible users, including HOVs, motorcycles, buses and toll-paying single occupant vehicles (SOVs), will be able to access the EL at designated locations during the hours of operation. Eligible vehicles with HOV status will continue to use the eastbound I-580 EL for free.

Solo users who want a more convenient and reliable trip can choose to use the EL for a fee. The fee that is charged will vary depending upon the traffic operating conditions in both the EL and the MF lanes. Two-axle, delivery-type trucks will also be allowed to use the new converted facility for a fee, but trucks with 3 or more axles will be excluded from the Lane.

Under this EL concept:

- The new EL are designed to operate 24 hours a day, 7 days a week, in the eastbound direction. However, the final decision on operating hours has not yet been determined. State legislation requires that the hours of the EL be consistent with the operating hours of the HOV lane.
- The assessed toll will be dynamically adjusted based on real-time traffic levels in both the HOT and MF lanes to ensure that EL traffic flow will be maintained at not less than Level of Service (LOS) “D.”
- The toll price will be posted on highly visible dynamic message signs (DMSs) which will be located upstream from the entrances to the EL allowing SOV

motorists to choose whether or not to use additional capacity in the lane for the posted toll rate.

- Static signs will clearly notify prospective and actual users of entrance and exit points of the EL.
- The tolling operation will be fully electronic, with no means for cash payments for each trip.

2. INTRODUCTION

Implementation of the eastbound I-580 EL is expected to provide, at a minimum, four important benefits to the motoring public in the region:

1. Carpools, express buses, motorcycles and selected other eligible vehicles will continue to be able to use an efficiently operating restricted lanes for free;
2. The EB I-580 EL will add a limited number of toll-paying SOVs to the converted lanes. The number of additional SOVs will be controlled by the amount of the toll that is dynamically calculated;
3. The EL will provide SOV users with a new option of paying for a faster, more reliable trip during the times when it is important and necessary for them to arrive at their destination sooner; and
4. The toll revenue generated by the EL will help pay for operation and maintenance of the facility and eventually for other transportation and transit improvements in the corridor.

This section provides an overview of the corridor and key aspects of the future EL operation. It also discusses the existing law enforcement and traffic management capabilities, a concept for the proposed EL electronic toll system (ETS), and the opening and management of customer accounts.

2.1 EXPRESS LANES CONCEPT AND PROJECT DESCRIPTION

The concept of a HOT lane is to maximize the efficiency of the existing HOV Lane by allowing otherwise ineligible vehicles to use excess capacity in exchange for paying a toll, while still maintaining a pre-defined, acceptable level of service. The amount of the toll would vary by traffic demand, subject to a minimum and maximum, while HOVs would use the lane for free. Use of extra HOV-lane capacity results in more effective use of the overall freeway capacity and provides a reliable travel option for those users who need a faster travel option.

Figure 1, which is presented on page 12, shows the assumed ingress and egress locations for the eastbound I-580 EL. A total of seven ingress and egress points are planned for the Project. The initial ingress point is located just west of Hacienda Drive. All eastbound users traveling east of Hacienda Drive would be able to access the EL at this location. Eastbound motorists entering I-580 at Hacienda Drive would not be able to enter the EL at this location. The first intermediate ingress point is located just west of Fallon/El Charro Road interchange to enable the EB I-580 EL users ingress from Hacienda Drive/Tassajara Road/Santa Rita Road. The first intermediate egress point is located just east of the Fallon/El Charro Road interchange. Motorists would exit at this location to access both Airway Boulevard and the future Isabel Avenue. The Portola Avenue interchange is assumed to be eliminated once the Isabel Avenue interchange is constructed.

A second egress point is located just east of Isabel Avenue. Motorists would exit at this location to access North Livermore Avenue and North 1st Street. The 2nd intermediate ingress to the EL will permit EL access from Airway Blvd. /SR 84. A third egress point is located just east of North 1st Street. Motorists would exit at this location to access North Vasco Road and Greenville Road. A final egress location is provided at the end of the EL system just east of Greenville Road. All EL traffic would exit at this location and merge with the general purpose lane traffic.

The total distance between Hacienda Drive and Greenville Road is 10.6 miles. As the EL begin just prior to Hacienda Drive and end just after Greenville Road, the total length of the EL is 11.3 miles. The EL would be separated from the MF lanes by solid double striped yellow lines and a solid white line to the inside. Ingress and egress access terminals would include an auxiliary lane formed by pavement markings. Ingress and egress by both free HOV and toll paying SOV traffic would be limited to the indicated access points only. Crossing the solid lines that form a buffer by any motorist would constitute a violation.

2.2 EB I-580 Express Lanes Management and Technology Solutions

The primary goals of the EB I-580 EL Project are to:

1. Better utilize HOV lane excess capacity to improve traffic throughput in the corridor; and
2. Optimize this new revenue stream to help pay for transportation improvements and transit operations in the corridor with revenue net of operations and maintenance.

Presented below are several important issues pertaining to the EB I-580 EL conceptual development, management and technology solutions that are under consideration.

Traffic Management and Law Enforcement

Traffic management and law enforcement for the I-580 corridor are already in place, including a Traffic Management Center (TMC) co-located with a Maintenance Dispatch Center in Oakland and a California Highway Patrol (CHP) dispatch center located in Vallejo. The TMC provides maintenance dispatch, CHP dispatch and traffic operations management, utilizing vehicle detector stations (VDS) and closed-circuit television (CCTV) cameras for off-site monitoring and observation of traffic conditions.

The CHP will enforce compliance with EL regulations. Various enforcement tools will be utilized by the CHP, including FasTrak transaction indicator beacons that will be located at each of the tolling zones and hand held enforcement devices. It is expected that a higher man hour commitment for enforcement of the EL by the CHP will be required. The additional enforcement costs will be funded by collected EB I-580 EL toll revenue.

Technology

The overall electronic toll system (ETS) will be owned and operated by the ACCMA and will consist of the roadside equipment, the TDC/Host, central processing components, and various system enforcement tools. The system will manage SOV traffic on the EL through dynamic toll rate setting. This will be accomplished through the near real-time monitoring of traffic flow in the EL and in the MF lanes to establish appropriate toll rates to either encourage or discourage SOV use of the lane, depending on whether or not additional capacity in the EL is available.

Under the proposed EL concept, the targeted LOS will be maintained at level "C" with the implementation of the following proposed technology solutions:

- Dynamic pricing will control the toll rate based on the level of congestion in the HOT and MF lanes. Toll rates will increase as the traffic in the EL increase and trends will be confirmed based upon levels of congestion in the MF lanes;
- The number of access points to and from the EL will be limited to pre-designated locations;
- Approximately 15 traffic monitoring locations will be used along the eastbound I-580 HOT Lane to continually record and monitor traffic volume, density and speed in the EL and in the MF lanes;
- The technology configuration will involve the use of DMSs that will display the current toll rate to users just upstream from each of the HOT Lane access points;
- A communication network will be implemented to support the tolling zone sites that read FasTrak transponders. The tolling zone sites will be equipped with a tolling zone controller (TZC). The TZC, which will include a rugged personal computer, will manage the transponder detection process (VDS and ETC FasTrak antennas and readers), subsystem communications, transaction record building , data storage, and receiving tag status file updates, timing, and configuration data, while transmitting tolling zone transactions and maintenance data from and to the TDC/Host;
- The transaction processor (TP) module will reside on the TDC/Host and will merge individual transaction records into single, one-way trips;
- The TDC/Host will collect the tolling zone ETC transactions, develop trips from the transaction records and transfer toll trip data to the Bay Area Toll Authority (BATA) Regional Customer Service Center (RCSC) for FasTrak account processing. EL trip data will be sent on, at least, a twice daily basis. BATA would then send payments for realized revenue to the ACCMA corresponding to account debits and payments for processed EL trip records; and
- Tolls will be assessed through the use of FasTrak transponders and account management services will be performed by BATA's RCSC to obtain payment. The RCSC will handle FasTrak account management activities, inventory and distribution of transponders, payment processing, updating and transmitting a tag status file, exchanging data and funds with California Toll Operators Committee

(CTOC) toll agencies, security/system administration and other ETC system financial functions.

Back Office Processing by BATA

The FasTrak RCSC is located in San Francisco and is operated by BATA. Prospective customers are able to open a FasTrak account and secure a transponder in person, by phone, mail or through the BATA website using a credit card, check or cash (in-person only). The same methods of account payment will be offered to the EB I-580 EL customers.

The RCSC provides a complete customer account and relationship management capability including automated interactive telephone system, state of the art account management and statement preparation, correspondence and document management, transponder inventory management, etc. BATA customer service representatives (CSRs) are trained in efficient account management, problem solving and customer relationship management. All FasTrak program questions will be answered by the BATA CSRs and any EB I-580 EL operational related questions will be transferred to the ACCMA back office operation so they can be handled by the ACCMA CSRs. ACCMA CSRs will be able to query RCSC stored EL FasTrak account information, in a read-only manner.

EL (FasTrak) customers will have the ability to manage their accounts on-line via the BATA account management system (AMS). This secure business management system is a fully integrated system used to manage toll revenue accounting, customer accounts and communications, FasTrak transponder inventory, scheduled and ad hoc reporting and customer service functions through a browser-based interface. The ACCMA will develop their own Web site that will describe the EB I-580 EB EL system and operations. The ACCMA Web site will contain a link that will allow people to access the BATA Web site to offer an opportunity to join the FasTrak program or query FasTrak accounts. The BATA Web site will contain a link that will allow motorists access to the ACCMA website so they can learn about the EL operation, policies, business rules, etc.

3. PRELIMINARY CONCEPTS FOR THE EB I-580 EXPRESS LANES SYSTEM

3.1 PROJECT LIMITS

This Project will cover the length of the existing eastbound I-580 HOV lane, which currently extends about 11 miles from just west of Hacienda Drive to just east of Greenville road. The Express Lanes (EL) access points will be limited in order to simplify the ETS, to increase vehicle throughput, and mitigate enforcement challenges on the facility.

3.2 DYNAMIC PRICING SCHEME

3.2.1 Dynamic Pricing Process

The EB I-580 EL will allow the unused capacity of the HOV lane to be used by SOV users, who are required to pay a toll, while maintaining level of service on the EL for carpools, transit vehicles, motorcycles and other eligible vehicles above a specified minimum. SOV passenger vehicles, including 2-axle trucks up to a maximize weight of 10,000 pounds, will be allowed to use the EL for a fee if there is available capacity in the lane to sell.

The number of SOVs entering the EL will be continuously managed in order to maintain traffic flow at a preferred LOS of "C" or better. SOV access to the EL will be controlled through the adjustment of the toll. The toll rate will be calculated based upon the LOS in the EL as confirmed by specific EB I-580 segment trends in the MF lanes.

Toll rates will rise as traffic increases in the EL and will be confirmed by traffic increases in the MF lanes. This will allow the system to regulate the number of vehicles that enter the EL and thereby maintain a LOS "C" or better. As HOV demand decreases and or speeds increases in the MF lanes, the toll rate will be adjusted downwards to optimize operation in the EL by encouraging more SOV motorists to pay the posted toll in order to use the additional capacity of the EL.

The approach to utilize the EL traffic speed and density data in conjunction with data from the MF lanes will allow the ACCMA to assess toll rates that strive to optimize use of the EL, subject to the desired LOS. This full lane traffic monitoring approach to toll rate setting will ensure that SOV users of the EL be charged an amount commensurate with perceived time savings that will entice use of the EL facility when excess capacity is available.

As the SOV motorist approaches an entry point to the EL, a DMS will display the current toll rate for use of the lanes. At each HOT Lane entry point, one or two specific rates will be displayed on the DMS to inform the motorist what toll amount will be assessed if

they travel either to an intermediate exit or to the end of the facility. If the SOV motorist chooses to enter the EL, the toll amount observed on the sign will be the maximum toll payment that is made by the motorist regardless of any rate changes that might occur while the motorist is utilizing the lane.

Approximately 15 vehicle detection station (VDS) locations will be deployed in the EL and about 15 VDSs will be installed in the MF lanes. The data gathered from these VDSs will be used to assess the levels of traffic volume, density and speed in both the EL and the MF lanes and to then calculate the appropriate toll rate.

3.2.2 Traffic Demand Pricing Calculation

As described above, the LOS targeted for the EB I-580 EL is "C", as defined in the *Highway Capacity Manual (HCM)*, which is published by the Transportation Research Board (TRB). The assessment of the LOS is based upon the Traffic Density (TD), which combines both volume and speed of traffic. The traffic volume is defined as the number of vehicles passing a certain point within an established time period. The traffic volume must be combined with the average speed of the vehicles because a low vehicle count alone could indicate either low congestion or, when the road is heavily congested with slow moving traffic.

Traffic data will be collected over a defined interval (e.g. 5–15 minutes). The TD (vehicles/mile/lane) will be computed from vehicle counts and speeds as follows:

Traffic Density = ((C/P)*3600)/(S*N)

Where: C = The total vehicle count over the period.
P = Length of the measurement period in seconds.
S = Average measured vehicle speed over the period in MPH.
N = The number of lanes in operation at this tolling zone in this traffic direction.

Traffic density is correlated to LOS using the data that is presented below in Table 1, which is based on data obtained from FHWA.

Traffic Table	
Level Of Service	**Traffic Density (Vehicles/Lane/Mile)**
A	0–11
B	>11–18
C	>18–26
D	>26–35
E	>35–45
F	>45

Table 1 – Traffic Levels of Service

Traffic densities at a single VDS may be impacted by environmental or geometric conditions and, therefore, might misrepresent the real-time traffic condition within a segment of the EB I-580 EL. To address any misrepresentation, a coefficient must be determined and applied to any affected TD.

The TD is used in the toll rate setting function, so that the toll rate will adjust up or down based upon the change in the EL TD. The change in the TD is the current TD minus the previously calculated TD. Small EL TD deviations might result in small or no change to the toll rates. Large deviations will typically result in large changes to the toll rates.

In addition to determining the TD at each VDS location, the variation of TD along the EL due to the impacts of traffic entering and exiting the facility will be considered. This is necessary to manage the number of vehicles entering the EL at any given point and to reduce their impact on downstream traffic congestion. This will be accomplished by assigning each VDS to a specific entry point for the calculation of the toll rate.

3.2.3 Using Mixed-Flow Lane Traffic Volumes to Adjust Toll Rates

Toll revenue optimization to support the project financially is one of the important goals. Toll revenue collection can be enhanced by designing into the ETS the ability to react quickly to changes in travel speeds in the MF lanes and adjust the toll rates to reflect EL demand and available capacity in these lanes.

The inherent advantages of a motorist using the EL are time savings and the elimination of frustration in having to drive in slow-moving MF lane traffic. The travel time in the HOT Lane, barring an incident in that lane, should be consistent during peak, off-peak

and shoulder periods and can be easily verified by VDS equipment in the lane. The density and speed in the MF lanes will be measured and compared to the density and speed calculations in the EL. A toll rate table can then be established to price trips, reflecting the toll rate displayed at the time the facility was entered for travel to certain destinations. Therefore, the goals of managing traffic in the EB I-580 EL and maximizing revenue would be accomplished.

3.3 EXPRESS LANES OPERATIONAL PARAMETERS

As described above, the number of access points to and from the EB I-580 EL will be limited to pre-designated locations. The access and egress points will be clearly signed and striped to indicate whether it is an entrance to the EL or an exit from the Lanes. It is expected that this approach will improve operations and safety by discouraging vehicle weaving when motorists drive into or out of the EL. Limiting the number of EL access points also reduces the number of tolling zones, which in turn simplifies enforcement and provides the motorists with toll rate information on a greater portion, if not all, possible destinations.

As of this writing, the EB I-580 EL operation will be 24 hours per day, seven days a week (24/7), pending an alternative decision by the ACCMA. A 24/7 operation is more easily understood by potential users since the choice to use the EL will always be consistent. A 24/7 operation will also permit the assessment of a zero dollar toll during specified time periods, if so determined by the operating agency. A 24/7 operation will also simplify the EL enforcement, signing and ETS design and operation.

Tolls will be collected via the use of FasTrak transponders. Toll-paying SOVs will be required to have a transponder that is in good standing. The EB I-580 EL operation will not require any changes to current FasTrak operations or Title-21 specification, but the lack of support for writing transaction information to the transponder limits the effectiveness of some enforcement tools.

Current California legislation allows the following vehicles to utilize the EL without paying a toll:

- Carpools with 2 or more passengers;
- Express buses;
- Motorcycles;
- Marked paratransit vehicles;
- Low emission vehicles; and
- Registered hybrid vehicles.

3.4 EB I-580 EXPRESS LANES GEOMETRIC CONFIGURATION

Presented previously in Figure 1 is a schematic that shows the proposed preliminary roadway system configuration for the EB I-580 EL. As noted above, the project will cover the eastbound I-580 travel corridor from just west of Hacienda Drive Interchange to just east of the Greenville Road Interchange. Based upon a preliminary assessment of access requirements, the proposed points of access and egress are depicted in Figure 1 below.

The schematic also shows the preliminary locations for tolling zones and dynamic message signs. The tolling zone locations will be at the western terminus just east of Hacienda Drive, just east of Fallon/El Charro Road, just west of North Livermore Avenue and west of Greenville Road. The schematic also shows the preliminary location of the various signs. This includes both static signs in advance of each access point, as well as dynamic message toll-rate signs that will be situated approximately one-quarter mile upstream of each entrance gore point to the EL.

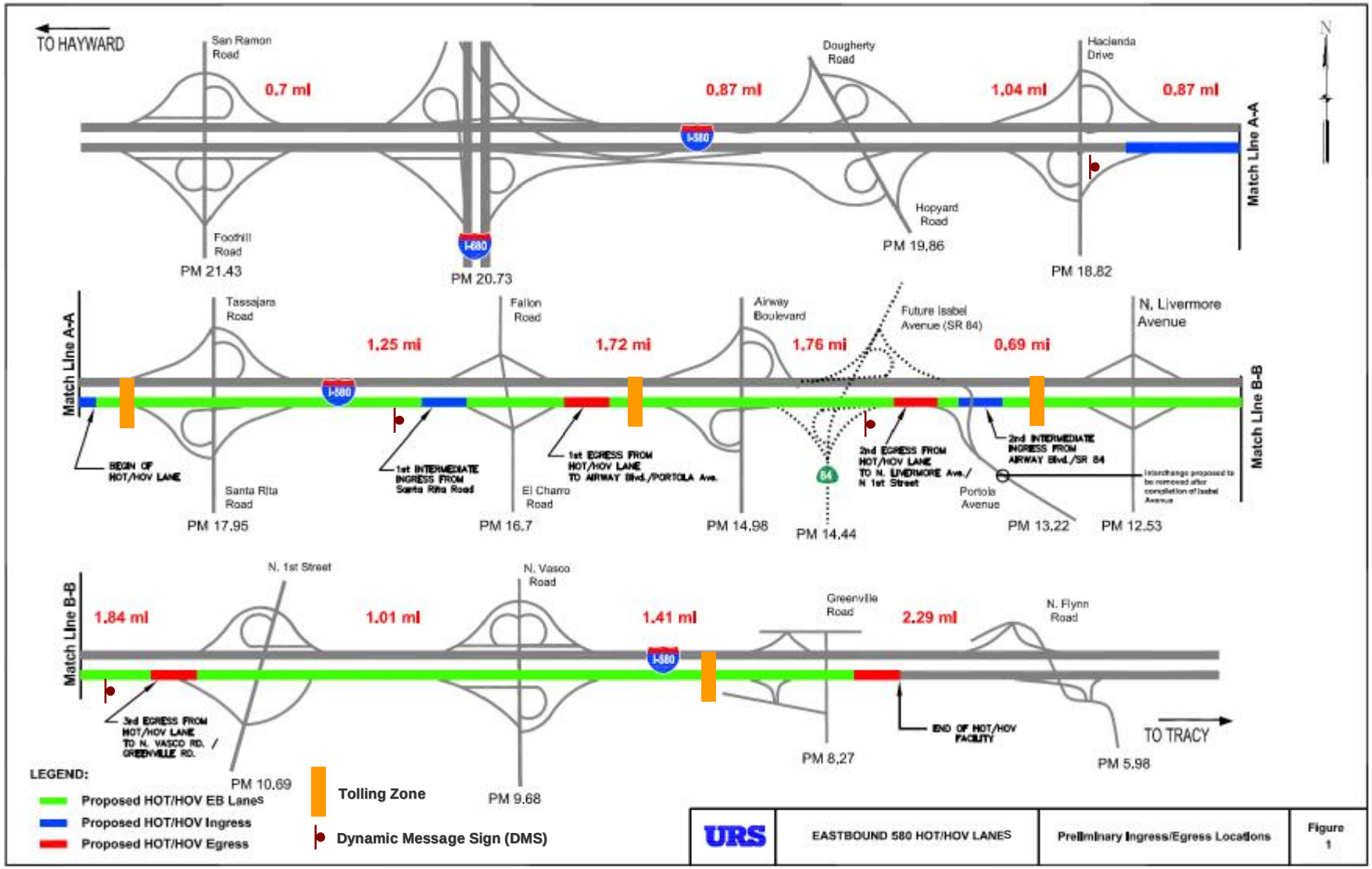

Figure 1 – Eastbound I-580 EL Configuration

The EL system will use new VDSs to continually monitor total traffic volumes and speeds in the EL and the MF lanes. This data will be obtained directly from the new VDS controllers, which will be designed, procured and deployed by the ETS Systems Integrator (SI). The MF lane VDS data will also be used for back-up purposes in case any of the new EL VDSs fail to provide the required data.

Enforcement areas will be strategically located along the EB I-580 EL to assist CHP officers in EL enforcement. The yellow lines shown in Figure 2 represent where the proposed enforcement zones will be located. Each of the enforcement zones will be located on the inside shoulder and will be approximately 4.8 meters wide and at least 400 meters in length. First enforcement area is expected to be implemented between Tassajara Road and Fallon Road. The second enforcement area will be situated just east of the 1st EL Egress point (west of Airway Blvd). The third one is to be located east of the 2nd intermediate EL Ingress point (west of N. Livermore Ave). The last and the longest enforcement zone will be provided between North 1st Street and Greenville Road in the eastern terminus.

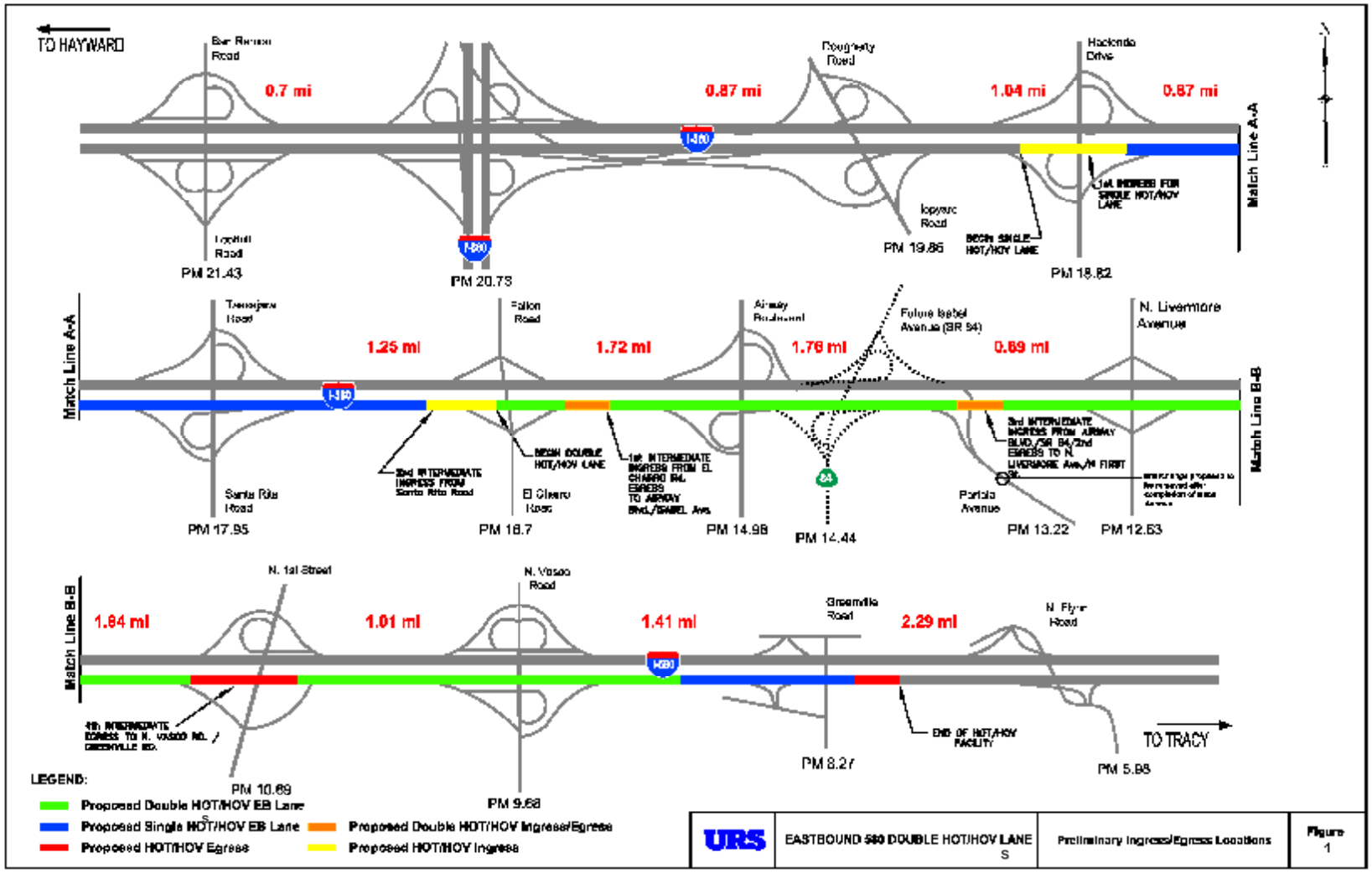

Figure 2 – EB I-580 EB EL Enforcement Zones

Presented in Figure 3 is a typical EL intermediate entrance/tolling zone concept. In this diagram, traffic flows from left to right. Vehicle operators in the MF lanes would first see the EL entrance advisory static sign, which would have a legend providing advance notice of an upcoming entry point to the EL. About one-quarter mile prior to a EL entry, a DMS, consisting of display modules inserted in sign panel openings, will display the current toll rate that is in effect at that point of entry for travel to one or more destinations. The tolling zones will be located just downstream from the access point.

Figure 4 shows a typical EL intermediate exit concept. Vehicles already in the EL will have an opportunity to exit at specific locations separated from entry points. A static sign, which will be mounted on the median barrier just prior to the exit point, would advise motorists the downstream interchanges serviced by the next egress.

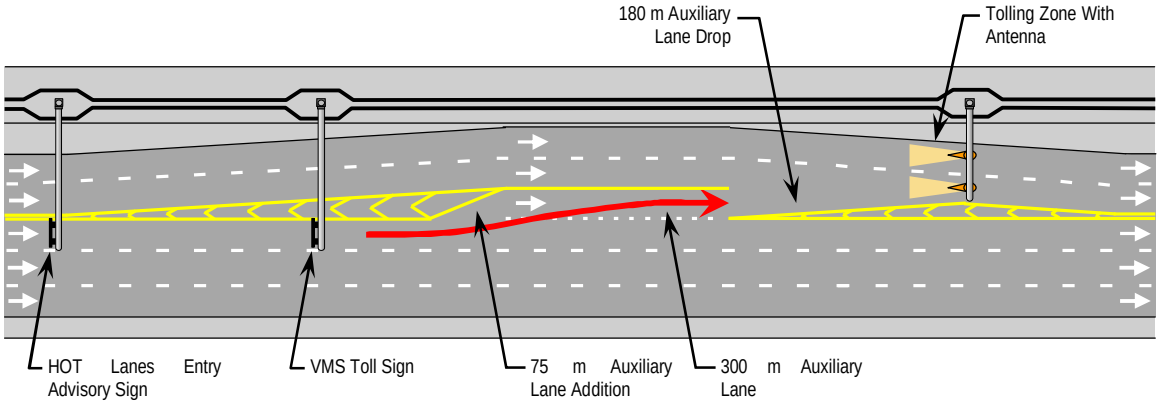

Figure 3 – EB EL Intermediate Entrance/Tolling Zone Concept

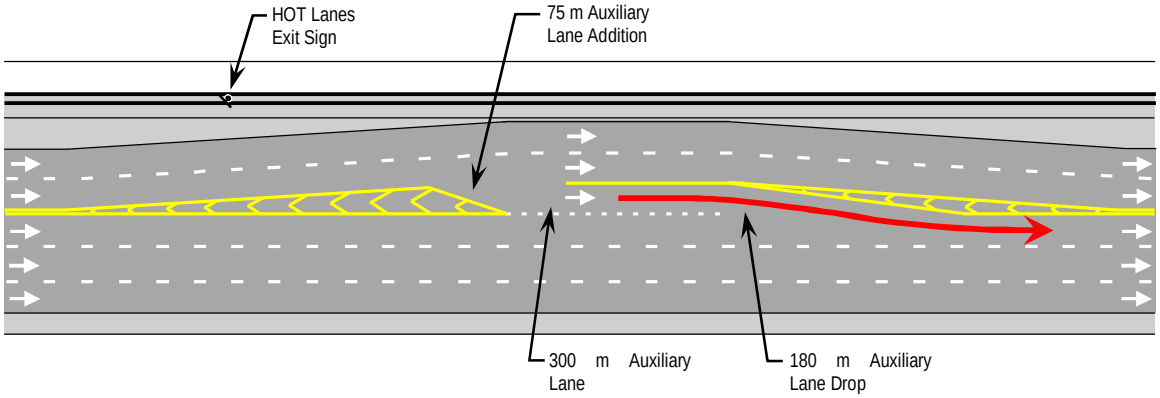

Figure 4 – EB EL Intermediate Exit Concept

3.5 EB I-580 EXPRESS LANES OPERATIONS FROM THE MOTORIST VIEW

The motorist's view of the EB I-580 EL system operations will be straight forward. Carpool, express buses, motorcycles and other authorized vehicles will continue to travel in the HOV lane or enter at the west end of the EL facility and incur no charge. SOV operators must have a valid FasTrak account, a properly installed transponder and incur a toll related to their destination in order to use the additional capacity in the EL.

While driving in the EB I-580 MF lanes or HOV lane upstream of facility, motorists will see the DMS that is placed in advance of entry points to the EL, which will indicate the current price to use the lane for travel to a maximum of three (3) destinations. At the west most EL entry point the DMS will show three toll rates, one for travel to the first and third exits and to the eastern end of the EL. At the second EL entrance point, the DMS will show three toll rates, one for travel to the second and third exits and to the eastern end of the EL. At the third entrance, the DMS will show two toll rates, which are the rates to travel to the first exit and to the end of the facility.

All vehicles that drive into the EB I-580 EL will travel through at least one tolling zone and the ETC antenna(s) will detect the presence of each FasTrak transponder. Tolling points are placed as close as possible to the EL entry point to ensure that the driver is charged no more than the rate that is displayed on the sign at the time of entry. The motorist will, in most cases, be charged the exact toll rate that is displayed prior to their entry into the EL. The motorist must never be charged more than the toll rate displayed at the time the user views the DMS prior to the entrance to the EL.

The EL SOV users will be informed when a transponder has been successfully read by an audible signal. Motorists whose vehicles are equipped with a transponder and who want to use the EL as an HOV must properly conceal their transponder in a protective mylar bag (which is given to them when they join the FasTrak Program) to prevent it from being read by the tolling zone antenna. Alternatively, if the Title 21 specification is revised to require the capability to disable or change the operating status mode of a transponder (e.g. additional field for HOV flag) by means of a switch, the motorists will not need to remove this special transponder.

3.6 EB I-580 EXPRESS LANES TECHNOLOGY CONFIGURATION

This section provides a functional overview of the EB I-580 EL technology to be implemented. Figure 5 – EB I-580 EB EL System Agency Roles provides an overview of the EL system layout. The basic system would consist of the following subsystems:

- Tolling Zone;
- EL Transaction Processing and Trip Building;
- Price Determination and Display Tracking;
- FasTrak Account Management;
- Incident Response/Safety; and

- EL Enforcement.

Tolling Zone (TZ) Subsystems – All of the roadside equipment, including the ETC antennas, ETC readers, controller units, enforcement beacons, VDS, electrical and lightning protection equipment, communication equipment, enclosure/cabinets and cantilever structures are located at the TZs. The primary activities that occur at the TZs are the detection and identification of transponders, generation of FasTrak transactions, collection of VDS data (for those VDSs directly linked to the TZ), storage of the TZ data, activation of an enforcement beacon, and communication with the TDC to transmit transactions and status messages and receive tag status file updates, access files and configuration data.

HOT Lane Transaction Processing and Trip Building Subsystem – This subsystem consists of the computers that receive transactions from the zone controllers and pricing information from a pricing table generated by a dynamic pricing module, builds EL trips, formats trip records according to BATA requirements and transmits the trip records to the BATA RCSC for processing, customer account assignment and revenue recognition.

Price Determination and Display Tracking Subsystem - This subsystem continuously receives and processes HOT and MF lane VDS data from facility roadside controllers, operates a dynamic pricing module, writes to a pricing table that relates location, time and date, and price at established price update intervals, downloads price data to HOT lane DMS, and receives display acknowledgement. The start and end of communication loss with a DMS is recorded in the pricing table.

FasTrak Account Management Subsystem (external) – The existing BATA RCSC will receive and process all of the EB I-580 EL trip records, provide FasTrak account management and maintenance functions for HOT Lane SOV customers, including FasTrak program membership applications, distribution of transponder kits, generation of EL (FasTrak) customer reports and other information to the ACCMA and support of CSR responses to FasTrak related queries. These services will be performed by BATA according to a services agreement that is developed between BATA and the operating agency.

Incident Response/Safety Subsystem (external) – This subsystem will be operated by the existing Caltrans Oakland TMC and requires an interface for a TMC operator to remotely take control of and change DMS display messages to either close or open to all motorists without incurring a toll in case an incident occurs on eastbound I-580 that requires temporary utilization of the EL or to perform maintenance work in the HOT or MF lanes, pursuant to the business rules.

EL Enforcement Subsystem – This subsystem includes CHP enforcement tools and equipment for enforcing the EL, including overhead tolling zone transaction indicator beacons (activated by the Toll Zone Subsystem), and hand held enforcement devices.

3.6.1 EB I-580 HOT Lane Communications Network

The ETS consists of roadside equipment for the monitoring of traffic volumes, speed and density, control of DMS displays, and the reading and recording of transponder equipped vehicles. All of this equipment will be connected to the appropriate TDC server via a communications network that handles the required duplex (two-way) broadband data transmission process. In addition, the BATA RCSC will need to be connected to a TDC server via a T1 or equivalent communications link. Due to the importance of monitoring traffic conditions in real time and collecting traffic volume, density, and speed data from the HOT and MF lanes in a timely, reliable, secure and highly available manner, a communications network is needed for successful operation of the EB I-580 EL.

Presented below are the various communication system nodes that will be required for the Express Lane operation:

- Tolling Zone Subsystem Nodes;
- Enforcement Equipment Nodes;
- TDC Node;
- BATA Regional Customer Service Center Node;
- Caltrans Traffic Management Center Node; and
- ACCMA Network Node (if separate from TDC).

3.7 EB I-580 EXPRESS LANES SYSTEM AGENCY ROLES

The EB I-580 EL System and operations will require a successful collaboration between several organizations. This section presents the agency roles in supporting the various subsystems and also explains what each agency is responsible for what part of the EB I-580 EL System operations. The agencies include the EL operating agency (assumed to be the ACCMA), BATA, Caltrans, and the CHP. Presented below in Figure 5 is a chart that shows the various agencies and what their specific roles will be pertaining to the EB I-580 EL operation.

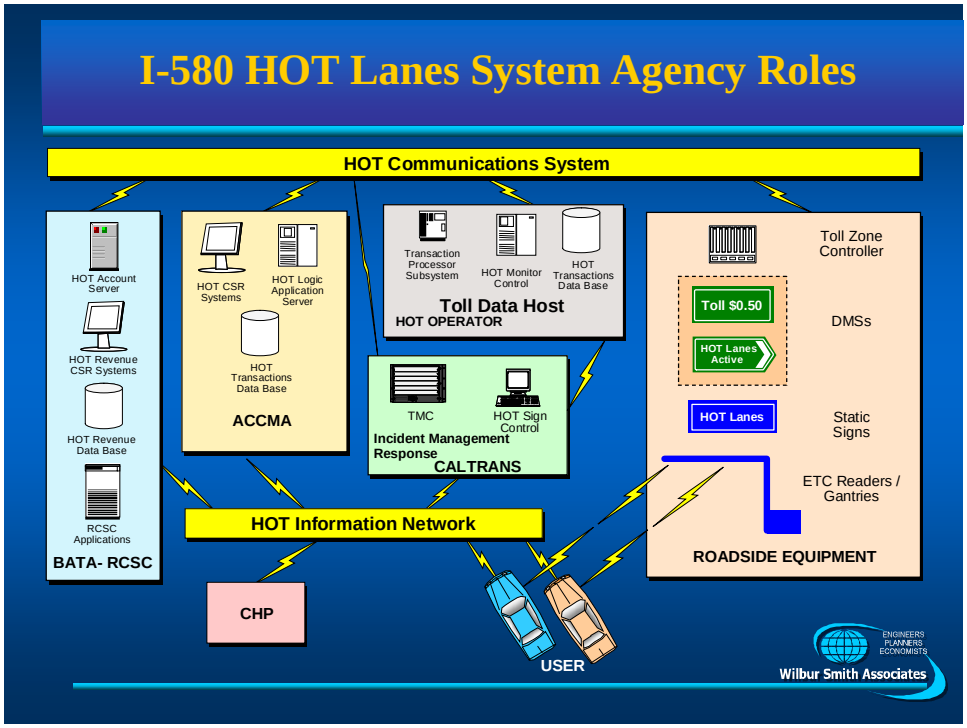

Figure 5 – EB I-580 EL System Agency Roles

The EL operating agency (ACCMA) will be responsible for the following:

- The EL toll transaction processing and trip generation, which is expected to be performed at the TDC/Host, tolling zone equipment and device control and monitoring, TDC/Host system administration and operations and maintenance;
- Operation, monitoring, maintenance and provisioning necessary technical support of the entire ETS, including the ETC readers, antennas, DMS and controllers, tolling zone controllers, VDS and controllers, CCTV equipment (camera, PTZ drive mechanism, monitors, and controller), the enforcement equipment that CHP will utilize, electrical distribution, backup and circuit protection equipment and all communications system equipment and components, which includes the links to BATA, Caltrans and the CHP;
- Traffic based dynamic pricing and toll rate setting process;
- Performing EL financial reconciliation with BATA customer account EL trip data;
- Reviewing scheduled and ad hoc TDC and RCSC reports generated by the respective servers handling EL System data;
- Coordinate EL and/or shoulder closures with Caltrans in order to properly maintain, replace and add EL signs, equipment and devices; and
- Maintain EL related static and dynamic signs, VDS devices and controllers, CCTV cameras, buffer and access terminal pavement markings and ingress and egress roadway lighting systems that are provided at the ingress and egress points.

BATA will be responsible for the following:

- Full trip record processing by the RCSC, including FasTrak customer account management, customer service interface to the public and payment processing and revenue management functions (e.g., interface with credit and debit card processing and banking services) ;
- Operate transponder inventory and tracking system, transponder fulfillment and deposit revenue management, and transponder replacement notification and handling;
- EL CSR functions and monitoring; and
- Generate scheduled and ad hoc EL reports, both summary and detailed, for trip revenue, uncollectable trips (with reason code), and deposits to the operating agency's bank account.

Caltrans will be responsible for the following:

- Safe operation of I-580, including the EL Project limits;
- Incident response management within the eastbound I-580 corridor, including the EL;
- Taking control of EL DMS messages, in coordination with operating agency staff, if an emergency traffic situation warrants an override of the ETS operation; and
- Roadway maintenance including barrier, guardrail, signs, sign structures, roadway lighting, pavement and pavement marking that are not specifically attributable to the EL.

The CHP will be responsible for the following:

- EL enforcement operation, for both toll violations (civil) and HOV occupancy violations (criminal) ; and
- Receive periodic downloads of FasTrak account status data (i.e. tag status files), which will be transmitted from the TDC, via some form of wireless communication to the hand-held reader device, either directly or indirectly.

3.8 TOLL SYSTEM DESIGN CONSIDERATIONS AND REQUIREMENTS

This section presents the EL ETS concept, including the vehicle, roadway, central account management and customer interface points. A more detailed description of the major subsystems follows. The ETS and EL equipment and software will be designed to be upwards compatible in order to take advantage of the most recent technological advances when the new tolling system components are procured, subject to agency design approval. Figure 6 provides a logical overview of the EL components and operations.

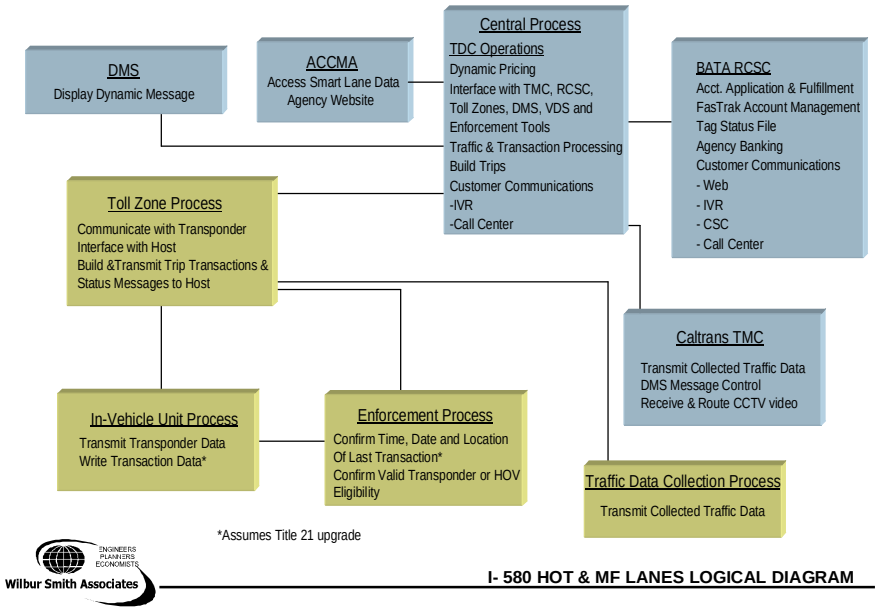

Figure 6 – EL Logical Diagram

The ETS consists of two major functional blocks; the roadway components and the central processing components. The EL will also include various enforcement tools. The EL ETS is designed to allow the dynamic management of SOV traffic in the EL. This is accomplished through near real-time monitoring of traffic flow on the EL and in the MF lanes to establish appropriate toll rates in order to either encourage or discourage SOV use of the EL.

The roadside subsystem consists of several major components, including vehicle mounted transponders, tolling zone equipment and devices, FasTrak transaction indicator beacons, DMS, CCTV cameras and VDS equipment and devices. Each of these components includes capability to transmit and receive data and or video. Provisions for secure and reliable wireless or landline communications is required to successfully integrate this subsystem with the EL System.

Although direct communication with the TDC is required, fiber optic communications may be used to link a DMS to transmission equipment installed at each TZC to support duplex communication with the TDC. The VDS controllers will be indirectly connected, with the Caltrans TMC through the TDC/Host, in order to provide HOT and MF lane traffic data. TMC operator DMS message override commands will be sent via the TDC/Host to DMS controllers on a pre-defined regional basis, which may include all regions. The new VDS equipment and devices will provide the ETS with continuous traffic volume, density and speed data for the HOT and MF Lanes to periodically (e.g., 3 to 6 minutes) update dynamic toll rate displays, when a rate change is calculated.

3.8.1 Title-21 Compliance

Title 21 was established to ensure that any ETC system that is installed in the State of California will be interoperable with all current and any future ETC systems in the state. Title 21, as it pertains to the toll industry, is detailed in Chapter 16 of the California Code of Regulations entitled "Compatibility Specifications for Automatic Vehicle Identification (AVI) Equipment". This section requires that all AVI (also referred to as ETC) equipment installed in the state of California be compatible with the standards and regulations set forth in the code of regulations. This compatibility specification has been developed around two principal front-end components: readers and transponders. The specification provides equipment and communication requirements for both the reader and transponder as well as defines the data message fields and message format communicated between the two devices.

The EB I-580 EL ETS will meet all Title-21 requirements of the toll system operational requirement standards that are in place in the Bay Area at deployment of the EL. Revisions to the Title 21 specification are needed to address a special transponder with an embedded switch to either disable or change the operating status mode of the transponder and to add fields to write previous transaction data for EL enforcement. The likelihood of these proposed changes being implemented is unknown.

3.8.2 Transponders

The transponders are small electronic transceiver devices that are primarily mounted on the inside of the vehicle's windshield typically behind the rearview mirror. In some cases it is necessary to utilize license plate mounted transponders for those vehicles with metallic windshields which cause radio frequency (RF) shielding inside the vehicle. Transponders enable the unique identification and tolling of SOV motorists electronically using RF technology.

The transponder is battery powered and user installable. The transponder communicates with an overhead antenna, which is installed at the tolling zones. Each transponder contains an embedded serial number and a surface UPC code that uniquely identifies it to the ETS and CSC staff. This allows it to be associated to a user's FasTrak account for paying the applicable toll.

The transponders will be identical to the currently used FasTrak tags which comply with all Title-21 requirements and utilize a protocol that is applicable for high-speed tolling.

The FasTrak transponder communicates with the driver via audible tones. This allows the system to signal the driver that the transponder is working correctly. Under normal operations, a beep will be sounded each time an SOV's transponder is detected as the vehicle traverses the tolling zone. If the SOV driver does not receive this audible tone then they will need to contact the RCSC to check their account status and/or have their transponder tested. If a FasTrak account holder is traveling on the EL as a carpool, in order to not have their transponder read they need to place the tag in a mylar bag.

3.8.3 Dynamic Message Signs (DMSs)

Each HOT Lane TZ will have one DMS installed just upstream from the access point into the EL. It is anticipated that the DMSs will be LED-based display modules imbedded in a static flat panel sign and capable of displaying alphanumeric characters. The number of display modules per sign will correspond to the number of destinations shown on the sign. The static portion will display general information about who is allowed to use the EL and prices (dynamic message portion) charged SOV users for travel to the shown destinations. .

3.8.4 Roadside Tolling Zone Sites

The TZs will be equipped with ETC readers, antennas, VDS, transaction indicator beacon communication gear and a TZ controller and electronics. The antennas, which will be mounted on a cantilever structure above the centerline of the EL, will communicate with each transponder mounted in SOVs while traveling through the TZ. The TZ site will consist of one antenna and a roadside cabinet that houses an ETC reader, communication gear, controller, electronics, lightning protection, and a power supply with battery backup.
Environmentally hardened equipment that is designed to withstand the weather conditions typically experienced in the Bay Area will be installed within the roadside cabinet. Each cabinet is provided with an external electrical disconnect and separation of clean and utility electrical service.

The ETC reader is connected to a combined antenna and transceiver, which is mounted over the EL as described above. The reader will be a Title 21 compliant encoder/decoder unit capable of reading RF signals received from transponders in the EL and sending the decoded data to the TZ controller. The controller writes this data to a transaction record along with other data and a unique sequential ID. The power supply ensures that clean and reliable power is provided to the ETS equipment even in the event of a power outage of at least 30 minutes.

All the components of the roadside system will either connect directly to the communications network or indirectly through an interconnection to the TZC.

3.8.5 Closed Circuit Television Cameras

CCTV cameras will be installed on a pole at each of the TZ sites for the primary purpose of viewing the DMS display and traffic conditions along the portions of the HOT and MF lanes within the camera's range. The CCTV cameras will be standard freeway surveillance cameras and will also provide security at each TZ and will allow observation of any physical problems that might occur at these locations, and traffic incidents and lane blockage, The CCTV system will be configured to allow pan/tilt/zoom capabilities and be designed for use by Caltrans staff to monitor traffic, accidents and other conditions along the corridor. The video will be routed to the TMC via the TDC where an interconnection to the existing matrix switch will be made by Caltrans staff. ACCMA

staff or authorized representatives will have capability of remotely selecting and controlling cameras for viewing on TDC monitors. ACCMA will have primary selection and control privileges for all cameras installed within the EL Project limits and Caltrans will have primary selection and control privileges for all other cameras connected to the existing Caltrans matrix switch. Video will be transmitted from the CCTV camera sites and TMC using MPEG4 encoders and decoders.

3.8.6 Tolling Zone Controller

The TZC is the primary roadside equipment (computer) that collects, processes and stores data (e.g., transaction and status) received from an interconnected ETC reader and VDS amplifier unit, outputs a transaction status signal to an indicator beacon, and manages communication with the TDC/Host subsystem. This communication supports receiving tag status files and updates, configuration data, access privileges table, and time synchronization, and sending transaction records and status messages. A redundant design may be needed to meet subsystem availability requirements so that the tolling operation can continue despite a failure within the TZC subsystem.

3.8.7 Vehicle Detection Stations

There will be approximately 15 VDSs installed in the EL and about 15 VDSs installed just off the outside MF lane shoulder. The VDSs will consist of equipment and devices embedded in the pavement and or along eastbound I-580 to measure vehicle volume, occupancy and speed in the HOT and MF Lanes. Vehicle detectors will connect directly to a roadside controller that communicates using landline or wireless bandwidth with the TDC/Host. TZ VDS will both directly connect to the TZC and to the nearest VDS controller for processing and input to the dynamic pricing module. Because of limitations on the separation of vehicle detectors and controller, EL and MF Lane VDS will be installed at approximately the same EL station to reduce the number of roadside controller cabinets and the associated communication and electrical costs incurred to make each site operational.

3.8.8 Transaction Processor and Trip Formation

As toll transactions are received from the TZCs, a Host-based Transaction Processor Subsystem (TPS) will write the records to the database. The TPS is responsible for the merging of individual transaction records into trip records, or what is typically referred to as trip formation or construction. The TPS will invoke pre-defined business rules to assure the toll assigned to the trip has a high probability of being lower or equal to the price displayed and viewed by each user prior to entering the EL facility. An example of such a rule is the need for consecutive transactions for a particular user occurrence within a configurable time interval to qualify for inclusion in a trip. The design could be based upon calculation of a variable time interval between consecutive transactions based on measured speeds and known distances. This subsystem will be located at the TDC/Host site and will be owned and operated by the ACCMA.

3.8.9 ACCMA Application Graphical User Interface with the EL

The ACCMA will be provided with a EL graphical user interface (GUI) that will offer predetermined options from which the ACCMA can select. The background applications will allow the ACCMA to change the operational mode of the EL. It is expected that there will be four possible EL modes:

1. Closed to all traffic;
2. Open to HOV traffic only (all other vehicles are considered violators);
3. Open to HOV and SOV (with valid FasTrak transponders) traffic only (SOV rate based on dynamic pricing); and
4. Open to all traffic (HOV plus a $0.00 rate for all others, no transponder required).

All tolling mode overrides will be recorded by the TPS to ensure ACCMA operating policy is being followed and the correct toll rates are utilized under each of the above identified operating modes. The ETS will also be capable of implementing prescribed automated operational procedures to revert the system back to normal tolling operation following these overrides.

TMC operator override of the EL will be performed under emergency conditions only and will include a simultaneous automated notice based on an entered emergency code that is sent to designated ACCMA staff The TMC operators will be able to change the operational mode of the EL but will not be able to change the toll rates that are set as part of the dynamic pricing process. Once an incident is concluded, the TMC operator will have to return control to the ETS by entering the information required by the GUI.

3.8.10 EL Enforcement

The CHP will be responsible for enforcing HOV occupancy eligibility and the requirement SOVs have a valid transponder mounted to their vehicle to pay the appropriate toll through the use of a valid FasTrak transponder. Violators will be cited for violating the HOV 2+ occupant policy. The enforcement task requires the officer to determine visually the number of occupants within the vehicle. If there is only one occupant, the CHP Officer would then need to determine whether that vehicle operator is using a valid transponder. To simplify the enforcement task, the ACCMA will provide the CHP with two enforcement tools; FasTrak transaction indicator beacons and hand held enforcement devices. These tools will allow the CHP to determine whether a transponder linked to a FasTrak account that is in good standing is read as it traverses a tolling zone.

3.8.10.1 FasTrak Transaction Indicator Beacons

Transaction indicator beacons will be installed on the tolling zone cantilever structures supporting the antenna to provide a means of accurately associating vehicle with transaction indicator beacon status. The beacons will be installed either on the upstream or downstream side of the cantilever and will include green and amber lights. The beacon

will be positioned to be clearly visible to a CHP officer from each enforcement staging area and the green light will illuminate when a FasTrak transponder linked to a FasTrak account in good standing is read as it traverses the tolling zone. Conversely, if a vehicle drives through the tolling zone and a valid transponder read does not occur, the amber beacon will illuminate, which will signify to the CHP officer that this vehicle must be checked to see if it is a valid, non-paying HOV vehicle.

3.8.10.2 Hand Held Enforcement Units

Hand held enforcement units will also be provided to CHP officers that are conducting EL enforcement, including motorcycles. This unit will operate as a wireless device, and therefore it can be transferred from vehicle to vehicle. This unit will be designed to read the transponder ID number from a transponder when it is swiped across the unit's read zone Once the transponder ID number is read, the software program that is resident on the hand held device will attempt to match the ID number to an active FasTrak account number, which is also resident in active memory in the unit, to determine whether or not the account is in good standing.

Updated versions of the FasTrak tag status file will be automatically downloaded from the TDC/Host to the hand held device each day at approximately 2:00 a.m. It is envisioned that an incremental tag status file will be transmitted each day to the hand held device, not the entire valid tag status file, but this operation is dependent upon the BATA RCSC capability and business rules that are in place at the time of ETS commissioning. This information will allow the CHP officer to issue a violation citation to the vehicle operator if the transponder (or account) is not valid and there is only one person in the vehicle.

3.8.11 EL ETS Equipment Maintenance

Maintenance of all components of the tolling system deployed to support the operation of the EL will be the responsibility of the ACCMA. The ETS equipment that is required for the operation of the EL will require periodic remedial and ongoing preventive maintenance.

Overhead DMSs and VDS equipment that is installed either above, in the EL pavement or just off the right shoulder will be accessed from the right shoulder or after closure of the EL during nights and at low traffic demand periods.

In the event that lane closures are necessary to maintain the ETS equipment, the ACCMA will be responsible for such lane closures.

3.9 FASTRAK ACCOUNT MANAGEMENT SYSTEM

3.9.1 Regional Customer Service Center (RCSC)

The BATA RCSC already exists. The RCSC function for this project will be provided and operated by BATA. The RCSC will have the following capabilities:

- Perform all of the required FasTrak account management functions;
- Perform all of the required RCSC functions, including the Call Center, front desk for walk-in customers and processing (of new applications, reports, etc.);
- Interface to the EL TDC/Host to allow ACCMA to send EL trips for posting to FasTrak accounts and for receipt of toll revenue from BATA and to send tag status file and update; and
- Patch calls to the TDC related to EL customer inquiry calls.

3.9.1.1 Hours of Operation

The BATA RCSC maintains regular business hours. The BATA FasTrak account management and information Web site and IVR system will be available on a 24-7 basis.

3.9.1.2 RCSC Front Desk

The RCSC front desk allows customers to conduct a full complement of FasTrak account transactions. They will be able to make payments, add or exchange transponders, open accounts, close accounts, update other account information, etc. A drop-box is also available for walk-in customers who choose not to wait for personal assistance. The RCSC front desk is staffed during regular business hours.

3.9.1.3 Telephone System and Call Center

The BATA telephone system will process incoming customer calls. It includes an automated interactive voice response (IVR) system that routes calls via menu selections. The system enables customers to review their account balances, payments and toll usage at any time, 24 hours a day, 7 days a week. The system also provides messages containing general information. During hours of operation, callers have the option to transfer to a CSR.

3.9.1.4 Web site Access

BATA hosts a Web site that presents information about the FasTrak program and provides access to FasTrak users that will allow them to check their accounts, pending payments, recent transactions, previous statements, ask questions about the program, etc. The Web site will also provide information about all of the Bay Area toll facilities and allow prospective FasTrak members to sign up on-line.

The ACCMA will also host their own Web site that will present information about the EB I-580 EL project, describe the way that toll rates are assessed to SOVs, hours of operation, enforcement procedures, pricing segment boundaries, historical toll rate/price information etc. The ACCMA site will also include a link that will automatically switch to the BATA Web site if customers have more specific FasTrak operational questions, want to check their account, wish to join the program, etc.

3.9.1.5 Mailroom

The BATA mailroom will be capable of printing, storing, enveloping and posting all customer related correspondence (statements, welcome kits, transponder fulfillment, etc.). The RCSC mailroom will also have the capability of opening and distributing all incoming mail for back-office processing.

3.9.2 FasTrak Account Management

Each customer account is associated with a number of basic attributes such as name, address, telephone number, e-mail address, credit card information, transponders and vehicles. This account management is currently in use by BATA. The RCSC system allows for each account to be associated with an unlimited number of those related attributes. Changes to any of those attributes are automatically logged and the history of changes is available for viewing by the customer on the website or by a CSR using the RCSC application.

3.9.2.1 Account Management Business Rules

The business rules for EL customer account management will be identical to the other FasTrak customers handled by BATA.

3.9.2.2 Account Type

The RCSC supports different types of accounts, including:

EL Personal Accounts; and
EL Commercial Accounts.

A non-revenue type account is considered an attribute of each of these basic account types. Other types of accounts could subsequently be added pursuant to agreement of BATA (e.g., Airport parking, Airport access, etc.). All revenue-based account types will be pre-paid.

3.9.2.3 FasTrak Account Opening

The RCSC system supports the functionality for application submission by walk-up, website, mail, e-mail, phone or fax and for payment by cash, check or credit card. Potential new customers may make account inquiries at the RCSC, online or via the IVR system.

3.9.2.4 Account Replenishment

Accounts may be established to be replenished either automatically via credit card, debit card or manually by cash, check, or one-time credit or debit card. The replenishment amount will depend upon the business rules that are set for BATA FasTrak operations.

Automatic replenishment is performed as soon as the account balance drops below the specified threshold. Accounts configured for manual replenishment will automatically receive notification (by e-mail or mail) when the account balance reaches a specified threshold. The customer will be required to call-in, mail or bring payment equivalent to the replenishment amount in order to restore their FasTrak account to good standing.

3.9.2.5 Account Monitoring

The RCSC and the TPS will provide the ability to monitor and identify unusual and undesirable activity (e.g., negative balance or frequent replenishment). System processes will include the ability to generate notices, assess penalty fees, offer incentive programs and other remedial actions.

3.9.2.6 Account Modifications/Updates

The EL customer will have real-time access to their account for updates and modifications either through the BATA website, IVR or the Call Center with a live CSR. The following information will be available:

- Personal information (including personal and billing addresses, phone numbers, e-mail, preferred contact method and time, etc.);
- Account type and plan (limited to CSR);
- Payment method modifications (switch to automatic replenishment, credit card update, etc.);
- Replenishment amount and threshold within set business rules;
- Transponder management (issuing new transponder, replacing non-working transponder, reporting a stolen transponder, returning a transponder, etc.);
- Vehicle information (including make, model, color, year, license plate);
- Customer password modification or reminder; and
- Any other comment about the account (complaint, etc.).

All changes to account attributes are logged to the RCSC database. The history of changes is available for viewing via online screens.

3.9.2.7 Account Suspension

The RCSC provides functionality for automatic deactivation and reactivation of all transponders associated with that account if the account is suspended and subsequently reactivated. The system automatically generates notices to customers in low or negative balance conditions. If the account balance becomes negative, all future transactions can be routed to Collection (depending upon the specific business rules). As soon as the customer replenishes the account balance, the account and associated transponders return to an active/valid state.

3.9.2.8 Account Closure

Accounts may be permanently closed when:

- The customer requests it;
- The account balance remains negative for a predetermined period of time;
- The account has no activity for a predetermined period of time; or
- A transponder is used in an unauthorized manner.

The customer will either be issued a refund if the account has a positive balance or automatic collection activities will be initiated for customers with a final negative balance.

3.9.2.9 Access to Customer Data and History

The BATA and ACCMA CSRs will have online access to all relevant customer information, including account number, address, payment details and most recent transactions. Additionally, they can access the customer history and perform searches either in the transactions or the notes history, using different criteria including date period or type of event, or they can perform a text search on selected customer account attributes or information types.

3.9.2.10 Customer Statements

The RCSC will generate standard FasTrak customer statements on a monthly or quarterly basis for mailing to customers. These statements are produced as electronic files that can be submitted to an external statement printing and distribution facility or printed and mailed locally. Statements can also be generated electronically in hypertext markup language (HTML), portable document format (PDF) or Word format by a BATA CSR who can then fax or e-mail the statement to the customer upon request.

3.9.2.11 Customer Notices

The RCSC will have the capability to automatically manage customer notices. The customer notices will depend upon the business rules but the usual customer notices include, but are not limited to:

- Change in replenishment method;
- Change in replenishment amount and threshold;
- Denial of replenishment due to non-sufficient funds for a check;
- Credit card declined (a card on account no longer valid);
- Replenishment required (for manual replenishment accounts);
- Pending credit card expiration;
- Transponder return required;
- Negative account balance warning;
- Account suspension or revocation; and
- Account closure.

3.9.2.12 ACCMA and RCSC Customer Web Sites

The ACCMA EL website will provide general information about the project for general public access, including:

- Description of the project and how it operates;
- Contact information;
- Maps, location and opening hours of the BATA RCSC;
- Links to traffic condition and live web cams;
- Frequently Asked Questions (FAQs);
- General announcements;
- A web link that brings the person directly to the BATA home page; and
- Other to be determined links.

The BATA RCSC website will provide potential and existing customers with online capabilities for the following:

- Application for new account;
- Review of the previous statements;
- Account balance and transaction history;
- Account replenishment via credit or debit card;
- Customer information modification (address, telephone number, change of payment method, change account type, etc.);
- Credit card information modification (change of credit card details, etc.);
- Vehicle information modifications (add or remove vehicle from the account, etc.);
- Apply for additional transponders; and
- Report lost/stolen/found transponder.

3.9.3 Interactive Voice Response System

The BATA telephone system will have an IVR module that will be connected to the customer account database. The IVR module will provide the EL customer with different options on a 24/7 basis, even when the RCSC is closed.

3.9.4 Revenue Management

The BATA RSCS will provide a variety of revenue management functions, including:

1. Automatic EL trip charges;
2. Payment processing;
3. Credit card payments;

4. Transponder inventory;
5. Transponder status updates;
6. Account management system reporting; and
7. Financial controls and processes.

3.9.5 BATA RCSC System Access

The BATA RCSC will have integrated access control mechanisms. Access to the system is controlled via security mechanisms implemented through the application software using security groups (all users belonging to a security group will inherit the access privilege of that group). Each log-in ID is associated with a security group that has pre-specified and limited access to application components (read/write, access to certain data, etc.).

Additionally, user passwords are encrypted using a real-time encryption scheme. If a user forgets their password, the Systems Administrator can only reset the password to some new value. The system requires passwords to be changed periodically. Access to certain critical system functions may require more than one password and user ID or more complex security measures.